ON THE UNIT OF RADIATION USED IN METEOROLOGICAL TREATISES ON ACTINOMETRY

By ANDERS ÅNGSTRÖM

[Statens Meteorologisk-Hydrografiska Anstalt, Stockholm, Sweden, Aug. 1927]

This question has recently been brought into discussion by Sir Napier Shaw,[1] who wishes to replace the unit hitherto commonly used—namely, *gram calory per square centimeter* with *kilowatt per square dekameter*. This unit has also, at least to some extent, been adopted by H. H. Kimball in his very valuable survey on actinometric data published in the MONTHLY WEATHER REVIEW, April, 1927.

To the present author it seems to be a very serious step to leave the uniformity of units, which hitherto has been a favorable characteristic of actinometric works of almost all countries, in order to introduce a duplicity of units, which necessarily will follow as a consequence if the proposal of Sir Napier Shaw should get adherers.

I can not find that the disadvantages hereof will be balanced by corresponding advantages.

In all the classical works of Langley, Knut, Ångström, Abbot and Fowle, Dorno, and others, the unit commonly used has been the gram calory per square centimeter, and it is highly important that the results of later investigators can be easily compared with the works already done without troublesome computations and reductions.

Further, it seems that in this case the gram calory is the most natural and logical unit. In all measurements of radiation within meteorology, the radiation is transformed into heat and not into electric energy, and the adopted unit of heat energy is the gram calory. I perfectly agree to the views of Mr. W. H. Dines, who in discussing this matter with Sir Napier Shaw in Nature of August 6, 1927, says:

> Also the gram calory lends itself very readily to the expression of the first result of radiation—namely, to changes of temperature; thus, by easy mental arithmetic the thickness of ice that can be melted, or of water that can be evaporated, or the change of temperature of a given layer of air is readily calculated.

This is certainly true. Against this we have the argument of Sir Napier Shaw that "the kilowatt is the unit that engineers use to represent electrical power; solar energy is thereby brought into the same category as the energy which men buy or sell."

It may be readily admitted that in popular treatises or in publications where it is aimed at the interest of certain groups of readers it sometimes may be of value to introduce other units than those commonly used in scientific papers. But this seems to me to be no reason why a scientific and logical unit commonly used should be abandoned.

The chief aim here is *uniformity*. If one or the other unit is used seems of minor importance as long as the one can be obtained from the other simply through multiplication with a reduction factor. The only way to secure uniformity is to adhere to the unit hitherto used in actinometric investigations—namely, the gram calory per square centimeter.

[1] Manual of Meteorology, vol. 1, Cambridge, 1926, p. 237.

NOTES AND ABSTRACTS

TORNADO AT CARRABELLE, FLA.[1]

A tornado occurred at Carabelle, Fla., on August 15, 1927. At that time Carabelle was within the southern extremity of a trough of low pressure that extended from New England to Florida. The pressure and temperature gradients over Florida and adjoining regions were feeble and thunderstorms occurred quite generally in the region where the tornado occurred. The latter is described as having a pendant funnel cloud, very dark with an appearance of red in the center. This cloud was in the northwest and was met by another cloud of not quite so menacing appearance coming from the opposite direction. There was intense lighting and continuous thunder. Rain fell in torrents for a few minutes; the catch in a 30 minute period was 2.12 inches. No lives were lost but the property damage amounted to about $55,000.

PRECIPITATION IN SOUTH AMERICA

Franze, Bruno: *Die Niederschlagsverhältnisse in Südamerika. Ergänzungsheft Nr. 193 zu Petermanns Mitteilungen.* Gotha. Justus Perthes. 1927.

In the assembling of this collection of monthly and annual averages of precipitation for the several divisions of South America Doctor Franze has made the contribution of a very valuable reference work. The data previously available in a single work, those published about 20 years ago by E. L. Voss [2] and Dr. Julius Hann,[3] give no information at all on conditions over large areas and some that has proven to be very inaccurate due to the scant material at hand at that time.

The recent increase in the number of stations in those countries where the network formerly covered the entire area in a general way and the wide extension of the field toward the interior in others, together with accumulation of additional data through a rather long period, have made possible his comprehensive rainfall map, which shows interesting features not charted by E. van Cleef [4] in 1921.

A comparison of the areas covered in the older works with those over which precipitation can be charted to-day shows highly satisfactory progress in Dutch Guiana, British Guiana, and Venezuela, where the frontier stations are now on the border of the unexplored highland, and also in the upper Amazon Valley (Amazonas), where the points of observation are at present well distributed over a vast area in which conditions were formerly entirely unknown. In the temperate zone a noteworthy advance in the determination of the distribution of precipitation has followed the establishment of stations in the interior and along the southern coast of Chile.

In the descriptive text, the tables giving geographic coordinates, elevations, lengths, and periods of records, and the monthly and annual means of precipitation with the sources from which they were obtained, Doctor Franze presents a finished work.—*W. W. Reed.*

MEASUREMENTS OF THE AMOUNT OF OZONE IN THE EARTH'S ATMOSPHERE AND ITS RELATIONS TO OTHER GEOPHYSICAL CONDITIONS. PART 2[5]

By G. M. B. DOBSON, D. N. HARRISON, and J. LAWRENCE

[Reprinted from *Science Abstracts*, July 25, 1927, p. 557]

The results of simultaneous measurements of the amount of ozone in the upper atmosphere are tabulated

[1] Condensed from a report by Meteorologist J. E. Sanders.
[2] *Handbuch der Klimatologie*, Stuttgart. 1908.
[3] *Die Niederschlagsverhältnisse von Südamerika, Ergänzungsheft Nr. 157 zu Petermanns Mitteilungen.* Gotha. 1907.
[4] Rainfall Maps of Latin America. Monthly Weather Review. Vol. 49, pp. 537–540.
[5] Roy. Soc. Proc., Apr. 1, 1927, 114 : 521–541.

for Oxford, Valentia, Lerwick, Abisko (North Scandinavia), Lindenberg (Berlin), and Arosa (southeastern Switzerland), slight corrections being applied to get more satisfactory values than those in the earlier paper. (See Abstract 1532, 1926.) (1) The annual variation with a maximum in April and a minimum in October is confirmed. (2) The departure of the amount of O_3 from the mean is found to be greater for days of high H than for days of low H, while the effect is more marked on days on high magnetic character. (3) The connection found with sunspots in 1925 broke down in 1926, and more observations are required, of which those from Montezuma will be most useful. (4) O_3 content is low for anticyclones and high for depressions, while for the latter the value is higher in the rear than in the front, as if the origin of the air affected the amount of O_3. An even closer relation exists for pressure in the stratosphere than for that at the surface. (5) O_3 may exist at a level such as 10 to 20 kilometers and not only in the higher levels. The lower layer is probably connected with anticyclones and depressions, and the upper layer with solar and magnetic conditions and probably also with the annual variations.—*R. S. R.*

METEOROLOGICAL SUMMARY FOR SOUTHERN SOUTH AMERICA, JULY, 1927

By J. BUSTOS NAVARRETE, Director

[Observatorio del Salto, Santiago, Chile]

During July the atmospheric circulation showed relatively moderate activity; in general, rain did not fall very frequently and there was a marked deficiency in the amounts received.

The most important cyclonic centers, accompanied by fair, cold weather, were charted through the following periods: 1st to 5th, 6th to 11th, 15th to 18th, and 22d to 31st. The first of these made itself felt in all of Chile and in a large part of Argentina.

The depressions most productive of unsettled weather and rain were those of the 1st–2d, crossing the extreme southern region; the 2d, lying off Isla Mocha; the 8th–15th, bringing heavy storms of rain and wind over a considerable area; the 18th–22d; and the 26th–31st, causing dense fog in all of the land.

Rains fell over the region extending from the Provinces of Atacama and Coquimbo on the north to Magellanes on the south. At Santiago the precipitation for the month was 112.2 mm. (4.42 inches), while at Valdivia it was 282.7 mm. (11.13 inches).—*Transl.—W. W. R.*

METEOROLOGICAL SUMMARY FOR BRAZIL, JULY, 1927

By J. DE SAMPAIO FERRAZ, Director

[Directoria de Meteorologia, Rio de Janeiro]

The secondary circulation continued active in this month with four migratory anticyclones and frequent changes of pressures. Temperature was particularly low in southern Brazil, with general frosts and high winds in the first and last decades.

Rainfall was plentiful in the north and scarce in the center and south. Good harvest of cotton, cane, cocoa, and coffee.

Rio's pressure was 3.7° millibars above normal and temperature was 0.7° C. under normal. Weather was generally fair in the capital with only one occurrence of high wind, from SSW., on the 24th.

BIBLIOGRAPHY

C. FITZHUGH TALMAN, in Charge of Library

RECENT ADDITIONS

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